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EVALUATION OF INSECT AND DISEASE PESTS IN THE ROUND BURN AREA, UPPER LAKE DISTRICT, MENDOCINO NATIONAL FOREST

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ABSTRACT

Four pest problems were examined within or near the Round Burn, Upper Lake Ranger District, Mendocino National Forest — 1) pine resin midge in ponderosa pine plantations, 2) cambium-feeding beetles in ridge-top trees that survived the fire, 3) white pine blister rust on sugar pine in mixed-species plantations, and 4) top dieback of large giant sequoias. An alternative for managing the pine plantations appears to be reducing the impact on growth by the pine resin midge. Vegetative competition and moisture conditions in 1985 appear responsible for a resurgence of activity by cambium-feeding beetles. Top dieback of giant sequoia seems an intractable problem. A long-term project has been initiated by the District to keep sugar pine in their reforestation program.

INTRODUCTION

Several insect and disease problems are present in or near the Round Burn, Upper Lake District, Mendocino National Forest. These are: (1) a continuing infestation of pine resin midge in ponderosa pine plantations, (2) cambium-feeding beetles infesting ridge-top trees that survived the fire, (3) a recent appearance of white pine blister rust on sugar pine in mixed-species plantations, and (4) top dieback of large giant sequoia. On July 2, we accompanied Jim Harvey, district silviculturist, to the area for examination of these problems.

EVALUATION OF CAMBIUM FEEDERS

Observations

During the Round Burn in 1966, most of the area impacted was destroyed; however, 500-800 acres along ridge tops in the Howard Mill vicinity were not consumed, but were underburned by an intense ground fire. The effects can still be seen on the lower bole of ponderosa pines where one side of the trees continues to bleed resin and circumferential growth has been restricted. Many Douglas-firs have long, linear scars that remain open.

Black stain root disease, Ceratocystis wageneri, was found in some dead and declining Douglas-firs, but not in others. This disease is scattered over the District and certainly accounts for a portion of the Douglas-fir mortality, but it does not explain most of the Douglas-fir branch decline or top-kill. Without felling trees, it was unclear what contribution to decline and mortality was made by the fir flatheaded borer, Melanophila drummondi, and twig beetles such as Pityophthorus pseudotsugae.

More importantly, a number of pines in the area have top kill from pine engravers, Ips sp., and basal pitch tubes from attack by the red turpentine beetle, Dendroctonus valens. The crowns of some trees have already faded, while the death of others was noted by the beginning of foilage discoloration from green to yellow green. Pitch tubes could not always be seen along the intervening bole with binoculars; however, the absence of western pine beetle, D. brevicomis, from the upper bole is unlikely.

Normal precipitation (50-60 inches annually, mostly November to April) occurred in the spring of 1986, but in 1985 the rains stopped in early spring. It appears that the pine mortality presently visible in the Howard Mill area is largely a result of beetle attacks from the late summer brood of 1985. The absence of pitch tubes on some of these moisture-stressed trees would not be unusual. However, some top kill appears to be of recent origin.

Some locations were overstocked, which may be predisposing pines and Douglas-firs to insect attack. Other trees appeared to be predisposed by heavy brush competition. Neither condition was present in some situations and one declining Douglas-fir even received regular watering because it served as a shade tree.

Discussion

The likelihood of mortality of specific trees is always a management question when scattered trees exhibit various characteristcs indicating permanent or temporary stress that leads to susceptibility to attack by bark beetles. This is particularly true of those pines that otherwise would be classified as immature-thrifty (Dunning's Tree Classes). The land manager wants to know if these pines should be marked for immediate removal in order to capture their green timber value as opposed to salvage, which has a lesser stumpage value. To this end, Table 1 gives some very general guidelines based upon tree

characteristics present in the vicinity of Howard Mill. In some situations, the tree characteristics shown in Table 1 may occur so quickly as to give little warning of impending mortality. This is most likely to occur in those narrow strips of timber that have been left by the fire or harvesting.

Table 1. General Likelihood of Pine Mortality from Western Pine Beetle When Predisposing Conditions Are Present

	Pine Engraver Attack		
Other Tree Characteristics	Loss of Top 4-5 Whorls	Top Loss to 6-8" Diameter	Top Loss to >6-8" Diameter
Attacks by red turpentine beetle present	Wait & see	Tree mortality likely	Tree mortality very likely
Injury from underburning, eg. resin flow	Tree mortality unlikely	Tree mortality likely	Tree mortality likely
Red turpentine beetle + injury	Wait & see	Tree mortality likely	Tree mortality very likely
No other stress apparent	Tree mortality very unlikely	Wait & see	Wait & see

Other than the few Douglas-firs with black stain root disease, declining Douglas-firs did not show any signs pertinent to their top and branch mortality. Past problems in the area indicate the involvement of the fir flatheaded borer and twig beetles. However, conditions contributing to susceptibility were not readily apparent. Possibilities are the dry spring of 1985 and vegetative competition.

Management Alternatives

1. **Do Nothing.** Any time an additional stress is placed on those trees damaged by intense underburning, bark beetles are likely to cause scattered mortality in the vicinity of Howard Mill. Thus, prospects are for continued mortality of the type experienced in the past 8 years.

2. **Salvage.** Timber values will be realized, but salvage will be a periodic and recurrent, limited entry operation until the 500-800 acres are regenerated.

3. **Sanitation.** Trees with signs and symptoms of stress and incipient bark beetle attack would be removed and utilized promptly. Accessibility and the frequency with which personnel move through the area make this possible if personnel are conscientious in monitoring for early symptoms such as discolored

foliage. This form of sanitation may be costly in the long run, and the economics of values gained and saved should be carefully considered. Table 1 may be useful as a marking guideline for pines.

4. Thinning. In general the stands are not overstocked. However, each tree competes with its neighbors, not the whole stand, and certain locations support excessive stocking. Reduction of competition for soil moisture would benefit the leave trees in these overstocked groups.

EVALUATION OF PINE RESIN MIDGE

Observations

Thus far about 7,000 acres of the Round Burn have been planted. The pine resin midge will not be a problem on 1/3 to 1/2 of the acreage because of nonhost regeneration or growth of the pines beyond the most susceptible height (3-15 ft). The midge is a problem or a potential problem on the remaining areas, and has been so since at least 1982 (Pronos and Schultz 1983). In this year the vegetative competition in one or more units was reduced by using a Track-Mac. As a result the trees in treated units are now increasing height growth and their crowns are closing to establish site dominance. Whiteleaf manzanita was largely eliminated, while the greenleaf manaznita is coming back.

The pine resin midge is still attacking the lower crowns of many of these pines, and some trees have permanently deformed limbs. However, the boles remain straight and the upper whorls now have only minor damage. The reduction in competitiion did not affect the insect, but allowed the trees to outgrow and overcome the effects of damage.

Additional units were "mowed" by a Track-Mac in mid-June. The pines in these units are smaller and younger and many have severe damage from the pine resin midge. Light damage from the pine needle-sheath miner also was present.

Discussion

Ponderosa pine stock from old seed zone X was used in early plantings on the Burn. These pines may not be suited to the site because seed zone X covered much of northern California. Off-site pines are usually more susceptible to damage from insects like the pine resin midge. More recent plantings are from local seed sources and should be less susceptible, particularly if they are of the glabrous or glaucous phenotype and not the viscid type (Duffield 1985).

Reduction of vegetative competition should create an environment in which the pines can outgrow the effects of the midge. However, in the absence of negative climatic events, midge populations probably will remain at high levels for as one unit grows above the most susceptible height (3 to 15 ft) where most damage occurs, another unit grows into the age and size class that seems most susceptible to infestation. These units need not be adjacent for the midge population of one to invade and impact a younger unit. The distance at which a spacial barrier to infestation would occur in an open area such as a burn is not known, but it certainly is not less than 50 yards (personal observation, Big Bar Ranger District, Shasta-Trinity National Forest).

Planting new areas with pine will continue the ingrowth of trees to the stage of greatest susceptability. Planting Douglas-fir or rust-resistant sugar pine are alternatives for the site quality of the Round Burn indicates good growth performance for both species. A moderate to heavy infestation of Douglas-fir needle midge occurred on scattered Douglas-fir in the Streeter Ridge-Horse Mountain area in the early 1980's; so good growing conditions would need to be maintained to offset effects of a resurgence of this insect. Minimizing vegetative competition should be a part of any prescription developed for plantations in order to prevent or reduce potential impacts caused by resident insect populations.

Management Alternatives

Three management alternatives were discussed by Pronos and Schultz (1983) — 1) **Do Nothing, 2) Clear Present Plantation and Replant, and 3) Release and Thin Current Plantation.** We have nothing to add to these other than to note that in the units recently treated by Track-Mac, there are not enough undamaged or lightly damaged trees to form a fully stocked stand. Given that many severely infested pines will eventually recover, the likelihood of normal stocking remains. However, potential growth may not be distributed to those trees best able to produce maximum volume because of prolonged reduction of height growth.

As an additional alternative we would add:
4) Plant Nonhost Species in Future Regeneration Efforts. Douglas-fir does well on many Round Burn sites and could be used alone or in mixture with other species to regenerate additional units. Vegetative competition should be minimized to reduce the probability that other insect species would replace the pine resin midge.

TWIG AND TOP MORTALITY OF GIANT SEQUOIA

We visited a site near Howard Mill Station where four giant sequoias were planted in 1914. These trees have grown well and are all over 30 inches dbh and up to 100 feet tall. They are growing in a grassy, open area with no other trees. Two of the trees, including the largest and most vigorous, had dead tops. Top dieback began in the spring of 1986. The two remaining trees had perhaps a dozen small dead twigs scattered throughout their crowns.

The canker fungus, Botryosphaeria ribis, was recovered from several of the dying twigs that could be reached from the ground. This fungus is commonly found killing branches of giant sequoia trees planted outside its natural range, and will also infect Douglas-fir, coast redwood, madrone, ceanothus, and manzanita. The appearance of B. ribis is routinely associated with plants growing under abiotic stresses, particularly inadequate moisture.
Because it was not possible to collect wood samples from the dead tops, we can only speculate that Botryosphaeria is responsible for the current top damage. Although this canker disease can kill the tops of giant sequoia, it has never been reported doing so on trees this large.

Control of the canker is rarely feasible for large trees in forest situations. Pruning dead twigs and branches from sequoias, along with fertilization and irrigation, are the only treatments available for ornamentals.

WHITE PINE BLISTER RUST

A group of 12 sugar pine with multiple blister rust infections was examined. All the trees were planted 18 years ago, and the infections dated back 3-4 years. This is the first observation of rust in any Round Burn plantations, and one assumption is that the fire eliminated much of the Ribes until recently. Blister rust will need to be considered in current and future management of the area, but just because the disease is present does not mean that sugar pine cannot be grown to commercial size.

Rust cankers can be placed into one of three categories: (1) non-lethal are those more than 24" from the bole; (2) lethal prunable are between 4" and 24" from the bole; and (3) lethal non-prunable are on the bole or within 4" of the bole. Bole cankers in the upper two whorls can usually be safely pruned assuming that the tree will survive and form a new top. These categories describe what impact a canker can have on its host, and whether it can be effectively removed.

Several of the trees we saw already had dead tops and will probably die. Others had both lethal, prunable and lethal, non-prunable cankers. Some pines, even though they have lethal cankers, may survive to reach merchantable size. It takes years for cankers to grow down a branch to the bole and to encircle and kill the bole. In general, fast-growing trees that are 5" dbh or larger at the time of infection will survive to reach a dbh of 12". Smaller trees with lethal cankers should be removed during precommercial thinnings.

Genetic resistance is the best approach for blister rust control, and only resistant sugar pine should be planted where rust is present or has caused damage in the past. The Upper Lake District is participating in the Regional program to screen for resistant pine. In fact, they have gone one step further by crossing rust-resistant individuals with identified superior sugar pines. We certainly commend this work and wish other Districts or Forests chose to do the same.

LITERATURE CITED

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